

MaineDOT Fish Passage Policy and Design Guide: First Annual Report

April 2003

prepared by:

MaineDOT Fish Passage Steering Committee

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MaineDOT Fish Passage Policy and Design Guide

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History and Purpose

During the 1990s, Maine Department of Transportation's (MaineDOT's) two-year program expanded substantially to include more total miles of projects to be completed within the two-year funding cycle. Design technologies and environmental permit processing and construction requirements developed steadily. In addition, drainage repair strategies were developed that are less expensive but can change the flow and passage characteristics of a structure. Addressing all of these changes together during project development had increasingly become more complex and MaineDOT recognized that protocols were needed so projects could consistently address fish passage in context with existing regulations and policies, interagency coordination, design practices, cost, and project schedules.

In 1999, MaineDOT convened and led a multiagency Fish Passage Work Group (Work Group), recognizing that consensus was necessary to address fish passage while producing better projects more efficiently. Cooperating agencies included:

- Maine Atlantic Salmon Commission
- Maine Department of Environmental Protection
- Maine Department of Inland Fisheries and Wildlife
- Maine Department of Marine Resources
- Maine Land Use Regulation Commission
- National Marine Fisheries Service
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

To identify ways to reach this goal, the Work Group examined current regulations and policies, current practices in agency coordination, existing standards for fish passage, fish species likely to be present and their passage needs, and engineering design and construction considerations. After examining these items, the Work Group developed recommendations for installing and repairing water-crossing structures in a way that:

- Complied to the extent practicable with current state and federal regulations on fish passage (Maine Natural Resources Protection Act and Land Use Regulation Commission guidelines, Federal Endangered Species Act, Magnuson-Stevens Fishery Management Act, and Clean Water Act);
- Included clear protocol for nature and timing of agency coordination;
- Enabled the Department to make use of new and developing technologies such as slip lining, plastic pipes, concrete invert lining;
- Considered cost and other impacts ;

- Reiterated Maine DOT's commitment to providing and coordinating fish passage; and
- Developed a base for biologic and hydrologic approaches to maintaining fish passage.

The outcome was MaineDOT's first Fish Passage Policy and Design Guide (Policy and Guide), released in March 2002. The document established a policy, process, and design guide with best management practices for fish passage and was specifically developed for MaineDOT projects with water-crossing structures. These structures include pipes or boxes of any type or size, commonly referred to as bridges, struts, culverts, pipes or pipe arches (with or without footings), and can be part of any MaineDOT program. The document provides a framework, guidance and tools to process crossing projects by balancing a variety of natural resource and engineering parameters at any given site. It is a living document that guides MaineDOT staff and coordinating agency representatives to develop and implement effective fish passage that meets regulatory requirements and resource needs, while delivering safe, cost effective, and timely projects.

Accomplishments in 2002

Steering Committee

The Policy and Guide was released on schedule in March 2002, and posted on the MaineDOT web site for public viewing. To implement it effectively, a multidisciplinary team was formed within MaineDOT from members of the original Work Group. This Steering Committee is responsible for assuring the document is kept up-to-date; improving it as we learn more about passing fish by research, networking and our own experience; implementing; and sustaining the document's use by MaineDOT staff who assess, design, and construct fish passage. The steering committee includes:

Richard Bostwick, Chief Biologist/Agency Coordination
 Charles Hebson, Chief Hydrologist
 Michael Wight, P.E., Bridge Engineer
 Robert VanRiper, Biologist
 Peter Newkirk, Environmental Engineer
 Sylvia Michaud, Chair/Policy

Implementation and Training

The draft document was widely distributed throughout MaineDOT for comment. As it was finalized, members of the Steering Committee met with the Maine Department of Environmental Protection, the Land Use Regulation Commission, and the Atlantic Salmon Commission to explain the content and purpose of the document. We were unable to set a date to meet with the Maine Department of Inland Fisheries and Wildlife; however, we coordinated closely and the Policy and Guide was announced throughout that agency. The document and its location on our web site were announced throughout MaineDOT and at a monthly Interagency meeting attended by state and federal regulatory and resource agencies who cooperate on MaineDOT projects. Copies have been distributed to each of the four teams in the Bridge Program and to others upon request. The Policy and Guide has since been incorporated by reference in the Department's Highway Design Standards Manual, and will soon be incorporated by reference into the Best Management Practices for Erosion and

Sediment Control (see section on BMP Manual.)

This Policy and Guide has rapidly attained *de facto* status as the statewide standard for fish passage employed by regulatory and resource agencies. In support of this effort, the Environmental Office of MaineDOT sponsored a two-day workshop, 18-19 November 2002, on evaluating flows and designing passage strategies, which was attended by over 100 people from MaineDOT, state and federal resource and regulatory agencies, and NGOs. A comprehensive program, ranging from policy review to design procedures and case studies, was offered. The featured presenter was Dick Quinn of the U.S. Fish and Wildlife Service. Dick has several years of experience in this work and is the principal engineering resource on fish passage for federal resource agencies in Maine. The workshop was well received by attendees. This effort underscores MaineDOT's commitment to developing effective and workable strategies for preserving fish passage through water-crossing structures.

Policy and Guide Use

Over the period since it was released, the Policy and Guide has been used to coordinate with agencies and to determine fish passage requirements. The process chart and other procedures in the document have been successfully used to coordinate project needs among resource agencies and MaineDOT hydrologists, biologists, designers, project managers and coordinators, and permit coordinators.

Two different approaches have traditionally been used for design. Hydraulic assessment may be calculated or determined by using historic information, as well as historic, anecdotal and personal experience. If an existing structure passes fish, "in-kind" replacement or rehabilitation can replicate what is in place and allow fish to pass after construction. Under other conditions, hydraulics should be evaluated mathematically, to assure that flows during critical periods will not be significantly altered and potentially block passage, or to correct structural conditions to allow passage.

Currently, several projects are being developed that use the recommendations of the Policy and Guide. For projects built in 2002, such as Wallagrass and Mt Vernon, the Policy and Guide has influenced passage strategies although exact formulae may not have been used. Maintaining passage has involved pool and weir and other step up strategies. Projects built in 2001/2002, using parts of the document include:

- Bar Harbor - invert lining;
- Belgrade - Unnamed tributary to Long Pond Castle Island Road, slip-lining;
- Blue Hill - Carlton Stream Bridge, Route 172, invert-lined;
- Herseytown - slip lining with outlet treatment;
- Kenduskeag - slip lining with outlet treatment;
- Mount Vernon - Unnamed tributary to Long Pond, Belgrade Road, stone pool and drop structure;
- Wallagrass - Weir structure built at downstream knick point;
- Whitefield - Replicated resting pool;
- Selected Locations Statewide - Embedded pipes (Regional Program, M&O).

Some of the first projects to be designed specifically using the design guide are to be built in 2003. Projects currently being designed include:

- Belgrade - Sanford Brook, Route 135, Proposed slip lining;
- Carrabassett Valley - Slip line;
- Lincolnville - Unnamed tributary to Pitcher Pond, Route 52, structure replacement planned;
- Linneus - Bither Brook Bridge, PIN 10049.00. Route 1A over Bither Brook. Slip line, 2 grade control structures downstream, weirs and baffles inside pipe;
- Paris/Buckfield - Route 117, CHIP project, numerous unnamed stream crossings and Stony Brook;
- Sebago - Batcheldor Brook, rehabilitate stream channel associated with highway relocation, remove former fishway;
- Waldo - Unnamed tributary to Passagassawaukeag River, Route 131, structure replacement planned;
- Westbrook - Mill Brook Bridge #5749, PIN 9031.00 Austin Street over Mill Brook; Replacement recommended after investigating other options such as slip lining, invert removal, baffles and grade control structures, which were not feasible;
- Windham - Black Brook Bridge #6243, PIN 10171.00 River Road over Black Brook Baffles and grade control structures being considered; and
- Regional/Urban and Arterial Projects - includes all stream crossings 'kicked off' by these MaineDOT programs.

Monitoring

Monitoring will be site-specific, with an initial habitat parameter inventory (baseline monitoring) before construction, followed by two years of post construction monitoring. Along with baseline monitoring, technical assistance will be available during preconstruction coordination. Construction assistance will be available as recommended in the Policy and Guide. Monitoring will assess the efficacy of technology we implement to allow fish to pass through a structure by creating suitable conditions. With commonly available measuring devices (that can be leased or purchased for reasonable cost), staff will measure water depth, velocity, take photographs at specified locations, check for other physical barriers to passage, and assess overall site conditions (stability, direct observation fish using structures to pass, etc.). If measurements imply fish passage is possible at the site, it will be assumed that fish are passing during critical periods and that project commitments for fish passage have been met. Additional monitoring protocol will be considered on a case-by-case basis and as cooperative efforts with other agencies. If, during or at conclusion of the monitoring period, any site appears impassable, MaineDOT will assess the problem and recommend remedial measures as appropriate, consulting with fisheries and regulatory agencies to resolve project issues. Monitoring started in 2002 includes:

2002

- Belgrade - Unnamed tributary to Long Pond Castle Island Road, MDOT slip-lined in 2001, 2 visits in Summer 2002 to record stream depths and velocities;

- Blue Hill - Carlton Stream Bridge, Route 172, invert-lined, 1 site visit Summer 2002, velocities and depths recorded, photographed;
- Mount Vernon - Stream was dry, precluding Summer 2002 review.

Monitoring in 2003 will specifically include:

2003 Baseline

- Belgrade (Sanford Brook)
- Carrabassett Valley
- Lincolnville
- Linneus
- Paris/Buckfield
- Sebago
- Waldo
- Regional and Urban and Arterial Projects

2003 Post Construction

- Bar Harbor
- Belgrade (Castle Island Road)
- Blue Hill
- Herseytown
- Kenduskeag
- Mt. Vernon
- Whitefield
- Wallagrass

Related Activities

USGS Low-Flow Study

Flow values assumed for periods when fish need to migrate are critical for designing culverts for fish passage. Existing equations for Maine to estimate low flows common during fish movement are more than 25 years old and need to be improved using the 25 additional years of data now available. MaineDOT has contributed approximately \$400,000, for use between 2000 and 2006, for maintenance and upkeep of United States Geological Survey (USGS) gauging stations in Maine where these data are collected. In 2002, MaineDOT made an additional financial commitment of \$22,500 to the USGS project to update low-flow equations. These equations will serve a number of agencies well beyond MaineDOT. This sponsorship demonstrates MaineDOT's commitment to the spirit as well as the letter of regulatory requirements for fish passage.

Fish Passage: Canada's Department Fisheries and Oceans' (DFO) Experience

In fall 2002, a few months after we released our Fish Passage Policy And Design Guide, we were contacted by the Moncton, New Brunswick Office of the Canadian DFO, who had seen it on our web site. We learned they had been working on fish passage for about 14 years and

were interested in talking with us. Denis Haché, an engineer primarily responsible for developing their guidelines, sent us their most recent fish passage guidelines.

He pointed out that he had started with guidelines very similar to ours and had improved them over the years. As of 2002, approximately 600 structures had been installed throughout New Brunswick and Nova Scotia using these guidelines, without a single failure and no identified maintenance problems.

We believe that, because Maine has similar geographic conditions to portions of the Maritime Provinces, we should examine the Canadian guidelines to help us further develop our own. This will save us from duplicating effort and spending more time than necessary meeting our goals. A MaineDOT technical working group met with DFO representatives from New Brunswick and Nova Scotia in January 2003 to discuss the Canadian guidelines, specifically where they differed from ours. We had an interesting exchange of ideas and came away more convinced that the Canadian guidelines were very well thought through and could help us. We believe the Canadian guidelines affirm our initial approach as an excellent starting point for improving fish passage technology in Maine.

There are at least three points we would like to examine in more detail in the Canadian guidelines.

- Using a longer stream profile to produce a better gradient through the structure for passage.
- Using one or two weirs inside the pipe to avoid issues related to acquiring additional right-of-way. These weirs have been reported maintenance free by the DFO.
- Using a slow water velocity design that will allow essentially any species to pass. The Canadian guidelines use one foot per second as their universal design flow velocity.

A multiagency follow-up site review of New Brunswick installations is scheduled for June 2003. We are looking forward to continuing this relationship, exchanging technical information and sharing monitoring data from the projects we construct here in Maine.

MaineDOT's Erosion and Sediment Control Manual (BMP Manual).

The BMP Manual is currently being updated. The scope is to address temporary soil erosion and sedimentation control. The 2003 version of the manual will include revisions to address fish passage based on the new Fish Passage Policy and Design Guide. Appropriate sections of the BMP Manual related to agency coordination and construction practices such as diversions, culvert outlet protection, in stream work, stream habitat protection and enhancement, and specific practices from the document such as pipe embedment guidelines, will refer to the Policy and Guide for currently accepted and recommended practices.

Review of Massachusetts Draft Technical Guidelines For River and Stream Crossings.

The focus of the Massachusetts document is replicating habitat and maintaining stream corridor passage for all species that use stream and riparian habitat, including fish, invertebrates, amphibians, and wildlife. It includes general measures that facilitate fish

passage based on providing adequate water depth and velocity and eliminating barriers, and recommends some of the same design practices as our Policy and Guide. In this particular sense, it's similar to our document. As part of our efforts to address passage by other species, the MaineDOT has become a new partner in "Beginning with Habitat(BWH)", a state multiagency initiative, and will be looking at wildlife riparian passage as part of that project. Some wildlife passage issues include budget considerations and we hope to be working through those as part of the BWH project.

Expectations Through Early 2004.

- 1) The Steering Committee has discussed the current Policy and Guide and agreed that, until we know more and have used it more, we will maintain it as it is. We will revisit it after the 2003 field season. In the interim, we will try new measures to find those that improve how we maintain and restore fish passage. We will add successful measures to our Policy and Guide as we verify them.
- 2) We will be traveling to New Brunswick in June for a field tour of established sites with the Canadian Department Fisheries and Oceans and the New Brunswick Department of Transportation, to see how their guidelines have been implemented. Representatives of state and federal resource and regulatory agencies have been invited and indicated an interest in attending. We hope to have our questions answered regarding design, construction, maintenance and effectiveness of fish passage measures.
- 3) We will monitor sites constructed before 2003 and complete preconstruction baseline monitoring for those projects that will be constructed in 2003 and 2004. Before beginning monitoring, we will develop specific monitoring protocol and coordination and ask for peer review by other agencies.
- 4) Our BMP Manual for erosion and sediment control will be revised to reflect practices in our Policy and Guide and cite the document as a resource. We will include references to our Policy and Guide and other appropriate MaineDOT manuals and publications.
- 5) As we begin to collect monitoring data, we will compile it into a database that can be used for future reporting and in-house review of sites. Our database will be linked to a maintenance inventory so conditions and concerns on each specific structure can be easily accessible from a common place.
- 6) We will examine inspection protocol to involve more staff people and share information with others in the Department to increase the understanding of new technologies and their appropriate uses.
- 7) We will share our practices and policy with towns and others outside MaineDOT who could benefit from our work by learning about it and adopting appropriate practices for their own work.

8) We will follow the 2003 season with an assessment report to agencies in spring 2004, which will include status of our effort and our processes at that time.

Conclusions

With the delivery of this report, we believe we have met all our commitments for 2002 as listed in the original Policy and Guide. We welcome any questions or comments on this report. Please direct them to Sylvia Michaud at sylvia.michaud@maine.gov or (207)624-3097.